

36. (New) A mass spectrometer as claimed in claim 35, wherein said lens comprises a y-focusing lens.

37. (New) A mass spectrometer as claimed in claim 35, wherein said lens comprises a z-focusing lens.

38. (New) A mass spectrometer as claimed in claim 35, wherein said lens comprises an Einzel lens comprising a front, intermediate and rear electrode, with said front and rear electrodes being maintained, in use, at substantially the same DC voltage and said intermediate electrode being maintained at a different voltage to said front and rear electrodes.

39. (New) A mass spectrometer as claimed in claim 38, wherein said front and rear electrodes are maintained, in use, at between -30 to -50V DC for positive ions, and said intermediate electrode is switchable from a voltage in said first high sensitivity mode of $\leq -80V$ DC to a voltage $\geq +0V$ DC in said second low sensitivity mode.

40. (New) A mass spectrometer as claimed in claim 35, further comprising a power supply capable of supplying from -100 to +100V DC to said lens.

41. (New) A mass spectrometer as claimed in claim 35, wherein said lens is selected from the group consisting of: (i) a stigmatic focusing lens; and (ii) a DC quadrupole lens.

42. (New) A mass spectrometer as claimed claim 35, wherein in said second low sensitivity mode a beam of ions is diverged to have a profile which substantially exceeds an entrance aperture to said mass analyser.

43. (New) A mass spectrometer as claimed in claim 35, wherein in said first high sensitivity mode at least 85% of ions in a beam of ions are arranged to pass through an entrance aperture to said mass analyser.

44. (New) A mass spectrometer as claimed in claim 35, wherein in said second low sensitivity mode less than or equal to 15% of ions in a beam of ions are arranged to pass through an entrance aperture to said mass analyser.

45. (New) A mass spectrometer as claimed in claim 35, wherein the difference in sensitivity between said first high sensitivity mode and said second low sensitivity mode is at least $\times 10$.
46. (New) A mass spectrometer as claim in claim 35, wherein said ion source is a continuous ion source.
47. (New) A mass spectrometer as claimed in claim 46, wherein said ion source is selected from the group consisting of: (i) an Electron Impact ("EI") ion source; (ii) a Chemical Ionisation ("CI") ion source; and (iii) a Field Ionisation ("FI") ion source.
48. (New) A mass spectrometer as claimed in claim 47, wherein said ion source is coupled to a gas chromatograph.
49. (New) A mass spectrometer as claimed in claim 46, wherein said ion source is selected from the group consisting of: (i) an electrospray ion source; and (ii) an Atmospheric Pressure Chemical Ionisation ("APCI") source.
50. (New) A mass spectrometer as claimed in claim 49, wherein said ion source is coupled to a liquid chromatograph.
51. (New) A mass spectrometer as claimed in claim 35, wherein said mass analyser comprises a Time to Digital Converter.
52. (New) A mass spectrometer as claimed in claim 35, wherein said mass analyser is selected from the group consisting: (i) a quadrupole mass analyser; (ii) a magnetic sector mass analyser; (iii) an ion trap mass analyser; (iv) a Time of Flight mass analyser; and (v) an orthogonal acceleration Time of Flight mass analyser.
53. (New) A mass spectrometer as claimed in claim 35, wherein said particular mass range includes a range having a mass to charge ratio (" m/z ") selected from the group consisting of: (i) $m/z \geq 40$; (ii) $m/z \geq 50$; (iii) $m/z \geq 60$; (iv) $m/z \geq 70$; (v) $m/z \geq 80$; (vi) $m/z \geq 90$; (vii) $m/z \geq 100$; and (viii) $m/z \geq 110$.

54. (New) A method of mass spectrometry comprising:
providing an ion source;
providing a lens downstream of said ion source wherein, in a first high sensitivity mode of operation, said lens focuses a beam of ions and, in a second low sensitivity mode of operation, said lens substantially defocuses a beam of ions;
providing a mass analyser downstream of said lens, said mass analyser comprising an ion detector; and
arranging to switch said lens from said first high sensitivity mode to said second low sensitivity mode upon determining that particular mass peaks in a mass spectrum are saturating or approaching saturation and mass peaks within a particular mass range in a mass spectrum are saturating or approaching saturation.
55. (New) A mass spectrometer comprising:
an ion source;
a lens downstream of said ion source; and
a mass analyser downstream of said lens, said mass analyser comprising an ion detector;
wherein said lens is regularly switched back and forth between a first high sensitivity mode of operation wherein said lens focuses a beam of ions and a second low sensitivity mode of operation wherein said lens substantially defocuses a beam of ions.
56. (New) A mass spectrometer as claimed in claim 55, wherein said lens comprises a y-focusing lens.
57. (New) A mass spectrometer as claimed in claim 55, wherein said lens comprises a z-focusing lens.
58. (New) A mass spectrometer as claimed in claim 55, wherein said lens comprises an Einzel lens comprising a front, intermediate and rear electrode, with said front and rear electrodes being maintained, in use, at substantially the same DC voltage and said intermediate electrode being maintained at a different voltage to said front and rear electrodes.

59. (New) A mass spectrometer as claimed in claim 58, wherein said front and rear electrodes are maintained, in use, at between -30 to -50V DC for positive ions, and said intermediate electrode is switchable from a voltage in said first high sensitivity mode of ≤ -80 V DC to a voltage $\geq +0$ V DC in said second low sensitivity mode.
60. (New) A mass spectrometer as claimed in claim 55, further comprising a power supply capable of supplying from -100 to +100V DC to said lens.
61. (New) A mass spectrometer as claimed in claim 55, wherein said lens is selected from the group consisting of: (i) a stigmatic focusing lens; and (ii) a DC quadrupole lens.
62. (New) A mass spectrometer as claimed in claim 55, wherein in said second low sensitivity mode a beam of ions is diverged to have a profile which substantially exceeds an entrance aperture to said mass analyser.
63. (New) A mass spectrometer as claimed in claim 55, wherein, in said first high sensitivity mode, at least 85% of ions in a beam of ions are arranged to pass through an entrance aperture to said mass analyser.
64. (New) A mass spectrometer as claimed in claim 55, wherein in said second low sensitivity mode less than or equal to 15% of ions in a beam of ions are arranged to pass through an entrance aperture to said mass analyser.
65. (New) A mass spectrometer as claimed in claim 55, wherein, in said first high sensitivity mode, greater than 60% of ions fall within the entrance acceptance profile of said mass analyser and wherein, in said second low sensitivity mode, less than 40% of ions fall within the entrance acceptance profile of said mass analyser.
66. (New) A mass spectrometer as claimed in claim 55, wherein the difference in sensitivity between said first high sensitivity mode and said second low sensitivity mode is at least $\times 10$.
67. (New) A mass spectrometer as claim in claim 55, wherein said ion source is a continuous ion source.

68. (New) A mass spectrometer as claimed in claim 67, wherein said ion source is selected from the group consisting of: (i) an Electron Impact ("EI") ion source; (ii) a Chemical Ionisation ("CI") ion source; and (iii) a Field Ionisation ("FI") ion source.

69. (New) A mass spectrometer as claimed in claim 68, wherein said ion source is coupled to a gas chromatograph.

70. (New) A mass spectrometer as claimed in claim 67, wherein said ion source is selected from the group consisting of: (i) an electrospray ion source; and (ii) an Atmospheric Pressure Chemical Ionisation ("APCI") source.

71. (New) A mass spectrometer as claimed in claim 70, wherein said ion source is coupled to a liquid chromatograph.

72. (New) A mass spectrometer as claimed in claim 55, wherein said mass analyser comprises a Time to Digital Converter.

73. (New) A mass spectrometer as claimed in claim 55, wherein said mass analyser is selected from the group consisting: (i) a quadrupole mass analyser; (ii) a magnetic sector mass analyser; (iii) an ion trap mass analyser; (iv) a Time of Flight mass analyser; and (v) an orthogonal acceleration Time of Flight mass analyser.

74. (New) A mass spectrometer as claimed in claim 55, wherein said mass spectrometer spends substantially the same amount of time in said first high sensitivity mode as in said second low sensitivity mode.

75. (New) A mass spectrometer as claimed in claim 55, wherein said mass spectrometer spends substantially more time in said first high sensitivity mode than in said second low sensitivity mode.

76. (New) A mass spectrometer as claimed in claim 55, wherein said lens is arranged to automatically switch between at least three different sensitivity modes.